



SEQUENCE LISTING

<110> Hanley-Bowdoin, Linda  
Orozco, Beverly M.

<120> GEMINIVIRUS RESISTANT TRANSGENIC PLANTS

<130> 5051.458

<140> US 09/289,346

<141> 1999-04-09

<150> US 60/125,004

<151> 1999-03-18

<160> 30

<170> PatentIn version 3.2

<210> 1

<211> 70

<212> PRT

<213> Tomato golden mosaic virus

<400> 1

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 2

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<212> PRT

<213> Tomato golden mosaic virus

<220>

<221> MISC\_FEATURE

<222> (12)..(15)

<223> RS-R125 (Ala1) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Ala Ala Ala Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 3

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<212> PRT

<213> Tomato golden mosaic virus

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<222> (27)..(36)

<223> E--N140 + KEE146 (Ala4+5) mutation

<400> 3

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Ala Ala Leu Ala Ala Ser  
20 25 30

Ser Ala Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 4

<211> 70

<212> PRT  
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<222> (42)..(44)  
<223> REK154 (Ala6) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Ala Ala Ala Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 5  
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<222> (47)..(49)  
<223> EKY159 (Ala7) mutation

<400> 5

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Ala Ala  
35 40 45

Ala Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe

50

55

60

Asp Lys Thr Pro Glu Pro  
65 70

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<222> (52)..(55)  
<223> Q-HN165 (Ala8) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Ala Phe Ala Ala Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

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<222> (59)..(62)  
<223> N-DR172 (Ala9) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
 20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Ala Leu Ala Ala Ile Phe  
 50 55 60

Asp Lys Thr Pro Glu Pro  
 65 70

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 <222> (7)..(8)  
 <223> FQ118 (Ala13) mutation

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Thr Leu Val Trp Gly Glu Ala Ala Val Asp Gly Arg Ser Ala Arg Gly  
 1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
 20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
 50 55 60

Asp Lys Thr Pro Glu Pro  
 65 70

<210> 9  
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<222> (10)..(10)  
<223> D120 (Ala14) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Ala Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 10  
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<222> (24)..(26)  
<223> AAA136 (Leu) mutation

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Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Leu Leu Leu Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 11  
 <211> 356  
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<220>  
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 <222> (354)..(354)  
 <223> Xaa can be any naturally occurring amino acid

<400> 11

Met Pro Ser His Pro Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe Leu  
 1 5 10 15

Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln Leu  
 20 25 30

Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys Arg  
 35 40 45

Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln Phe  
 50 55 60

Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val Ser  
 65 70 75 80

Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys Ser  
 85 90 95

Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu Val  
 100 105 110

Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys Gln  
 115 120 125

Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys Glu  
 130 135 140

Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu Phe  
 145 150 155 160

Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys Thr  
 165 170 175

Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn Val  
 180 185 190

Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser Ser  
 195 200 205

Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp Ser  
 210 215 220

Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn Tyr  
 225 230 235 240

Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys Val  
 245 250 255

Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu Lys  
 260 265 270

His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn Cys  
 275 280 285

Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile Val  
 290 295 300

Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp Lys  
 305 310 315 320

Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys Phe  
 325 330 335

Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser Asn  
 340 345 350

Asn Xaa Asn Ser  
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 <213> Tomato golden mosaic virus

<400> 12

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly



1                      5                      10                      15  
 Gly Cys Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
                     20                      25                      30  
 Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
                     35                      40                      45  
 Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
                     50                      55                      60  
 Asp Lys Thr Pro Glu Pro  
 65                      70

<210> 13  
 <211> 70  
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 <213> Tomato golden mosaic virus

<400> 13

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
 1                      5                      10                      15

Gly Cys Gln Thr Ser Ala Ala Ala Ala Ala Glu Ala Leu Asn Ala Ser  
                     20                      25                      30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
                     35                      40                      45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
                     50                      55                      60

Asp Lys Thr Pro Glu Pro  
 65                      70

<210> 14  
 <211> 70  
 <212> PRT  
 <213> Tomato golden mosaic virus

<400> 14

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
 1                      5                      10                      15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Ala Ala Leu Ala Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 15  
<211> 70  
<212> PRT  
<213> Tomato golden mosaic virus

<400> 15

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Ala Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
50 55 60

Asp Lys Thr Pro Glu Pro  
65 70

<210> 16  
<211> 70  
<212> PRT  
<213> Tomato golden mosaic virus

<400> 16

Thr Leu Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly  
1 5 10 15

Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser  
20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys  
 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe  
 50 55 60

Asp Ala Thr Pro Ala Pro  
 65 70

<210> 17  
 <211> 31  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for FQ118 (Ala13)

<400> 17  
 cacttcgacc gtcgaccgcg gcttctcccc a 31

<210> 18  
 <211> 31  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for D120 (Ala14)

<400> 18  
 cacttcggcc ggcgaccgcg gcttctcccc a 31

<210> 19  
 <211> 35  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for RS-R125 (Ala1)

<400> 19  
 gcaacctcct gcagcggccg caccgtcgac ctgga 35

<210> 20  
 <211> 35  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for QT130 (Ala2)

<400> 20  
 cagcgtcggt gctagctgcg caacctctc tagca 35

<210> 21  
 <211> 29  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for ND133 (Ala3)

<400> 21  
 ctgctgcagc ggccgcagat gtttggcaa 29

<210> 22  
 <211> 35  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for E--N140 (Ala4)

<400> 22  
 ggaagaagca gctaacgcgg ccgctgcagc gtcgt 35

<210> 23  
 <211> 35  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for KEE146 (Ala5)

<400> 23  
 cagcgtcggt agcagctgcg caacctctc tagca 35

<210> 24  
 <211> 32  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for REK154 (Ala6)

<400> 24  
 ttctgggatt gcggccgcaa ttatctgcag gg 32

<210> 25  
 <211> 35  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for EKY159 (Ala7)

<400> 25  
 gaactgaaat aaagcggccg ctgggatttt ctctc 35

<210> 26  
 <211> 42  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for Q-HN165 (Ala8)

<400> 26  
 gctattttaga gcggcgaacg caaataaata tttttctggg at 42

<210> 27  
 <211> 36  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for N-DR172 (Ala9)

<400> 27  
 atcaaataatc gcagctagcg cgctattttag attgtg 36

<210> 28  
 <211> 33  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for K--E179 (Ala10)

<400> 28  
 gaagccatgg cgccggagtc gcatcaaata tcc 33

<210> 29  
 <211> 37  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Mutagenesis oligonucleotide for AAA136 (Leu)

<400> 29  
 gaagcattta aggcctctag tagaaggctg ttagatg 37

<210> 30  
 <211> 54

<212> DNA

<213> Artificial sequence

<220>

<223> Mutagenesis oligonucleotide for E--N140 + KEE146 (Ala4+5)

<400> 30

tctgcagggc tgcggccgcg gaagaagcag ctaacgcggc cgctgcagcg tcgt

54